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PROPOSED AMENDMENTS TO  
ONTARIO REGULATION 634/86  
FOR  
**DIVING OPERATIONS**

October 24/92



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October 24/92

PROPOSED AMENDMENTS TO  
ONTARIO REGULATION 608/04  
FOR  
DIVING OPERATIONS

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## **INTERPRETATION**

### **1. In this Regulation,**

“adequate”, in relation to a procedure, material, device, object or thing, means sufficient for its intended use and sufficient to protect a worker from damage to the worker’s body or health, and “adequately” has a corresponding meaning;

“ambient pressure” means the external pressure acting on the body of the diver;

“atmospheric diving operations” means diving operations in which an atmospheric diving system is used;

“atmospheric diving system (ADS)” means a diving system capable of withstanding external pressures greater than atmospheric pressure, and in which the internal pressure remains at one atmosphere, and includes a one person submarine and the one-atmosphere compartment of a diving submersible;

“bail-out system” means an independent, emergency breathing gas supply, worn by the diver, with sufficient quantity to return the diver to the wet bell, submersible compression chamber, lock-out submersible or the surface, in the event of a malfunction of the primary gas supply;

“bottom time” means the total elapsed time measured in minutes, from the time a descending diver leaves the surface to the time the diver begins final ascent, rounded to the next whole minute;

“bounce diving” means a form of diving that uses a submersible compression chamber in which decompression occurs immediately upon ascent from the work site;

“breathing mixture” means a mixture of gases for human respiration including compressed air, pure oxygen and deep diving and therapeutic mixtures, that are suitable in terms of composition, temperature and pressure for the

work to be undertaken, and for the conditions under which the diving operation is to be conducted;

“contaminated environment” means a workplace that contains a chemical, biological or radiological material in sufficient concentration that should any quantity of it be ingested, absorbed, adsorbed or inhaled, will likely endanger the health of the worker;

“contamination reduction zone” means the workplace used to transfer workers from the exclusion zone, and for decontamination of personnel and equipment;

“daily dive plan” means a document describing the task to be performed, how the task is to be performed, the environmental conditions, the identifiable hazards, any specific emergency procedures and the appropriate contingency plans;

“decompression table” means the procedure that a diver follows during the ascent from depth in order to minimize the risk of decompression sickness;

“deep diving operation” means any diving operation to depths greater than fifty metres (165 feet);

“diver” means a worker who performs work underwater either at ambient pressures or at one-atmosphere in a submersible or atmospheric diving system;

“dive location” means the geographic location of the dive site;

“diving operation” means any work performed underwater by divers or any work performed on the surface in support of divers;

“diving plant and equipment” means the plant and equipment that are used in, or in connection with, a diving operation and includes the plant and equipment that are essential to a diver;

“diver’s tender” means a worker who is competent to tend divers;

“diving supervisor” means a competent person having complete and direct responsibility for a diving operation, including responsibility for the safety and health of all diving personnel;

“diving harness” means a harness strong enough to lift a diver and his/her equipment from the water in an emergency, with,

- i) a positive buckling device,
- ii) an attachment point for the lifeline to prevent strain on the mask, helmet and umbilical bundle;

“dive site” means the location at which diving personnel, plant and equipment are located in support of the work site;

“exclusion zone” means the workplace at the surface where divers are dressed, undressed and tended from, during a contaminated diving operation;

“hookah” means a surface supplied breathing system utilizing S.C.U.B.A. second stage, supplied from an umbilical bundle;

“hyperbaric chamber” means a pressure vessel complete with associated plant and equipment designed for pressures greater than one-atmosphere and approved for human occupancy;

“life support system” means a system comprised of the breathing mixture supply system, decompression and recompression systems, environmental control systems and equipment, and supplies that may be required to provide accommodation under all pressures and conditions, that a person may be exposed to during a diving operation;

“lifeline” means a rope having a breaking strength of not less than 2,454 kilograms;

“liveboating” means a diving operation that is conducted from a vessel underway;

“locked-out” means made inoperable by means of padlock for which the key is held only by the diving supervisor or his/her assigned;

“lock-out submersible” means a self-propelled submersible fitted with a submersible compression chamber from which a diving operation can be carried out and that has a separate one-atmospheric chamber from which the submersible is operated;

“medical hyperbaric treatment facility” means a medical centre that is capable of providing the specialized medical services for the treatment of diving ailments;

“mixed gas” means a respirable breathing mixture other than air that provides adequate oxygen to support life and does not cause detrimental physiological effects, particularly breathing resistance or impairment of neurological function;

“no-decompression limit” means that, in accordance with the diving decompression table in use for the depth and duration of the dive, no decompression stops are required during the ascent;

“non permeable diving suit” means a diving suit that does not permit the contaminated environment to make contact with a diver;

“qualified physician” means a licensed medical doctor, knowledgeable in diving and hyperbaric medicine;

“saturation diving” means a technique of diving in which the decompression procedure used allows a bottom time of unlimited duration;

“S.C.U.B.A.” means a self-contained underwater breathing apparatus;

“stage” means a cage, basket or platform in which a diver may be lowered to or raised from an underwater work site;

“standby diver” means a diver trained and equipped to operate at the depths and in the circumstances in which the submerged diver is operating and prepared to render

assistance to the submerged diver in the event of an emergency;

“submersible compression chamber” means a chamber that is intended to be submerged and that is designed to transport a person at atmospheric pressures or divers at pressures greater than atmospheric pressures from the surface to an underwater work site and back and includes the compression chamber of a diving submersible;

“suitable”, in relation to a procedure, material, device, object or thing, means sufficient to protect a worker from damage to the worker’s body or health;

“support zone” means the workplace used in support of the diving operations and where the cleaning and/or disposal of diving plant and equipment may take place;

“surface–supply diving” means a diving technique in which the diver is supplied with a breathing mixture by way of an umbilical bundle from the dive site;

“therapeutic recompression” means the recompression treatment of a diver in accordance with suitable tables and practices;

“umbilical bundle” means a composite of hoses and cables capable of supplying a breathing mixture, power, heat, communications, and other services as required and includes a lifeline that is attached in a manner to prevent stress on the hose;

“unusual incident” means an unplanned occurrence that may have put the diver at risk and may include such things as equipment failure, omitted decompression, a work related mishap or an environmental hazard;

“vessel underway” means a vessel that is not at anchor, made fast to the shore or a fixed structure;

“wet bell” means a platform that transports divers and designed with a dewatered upper compartment and is equipped with a breathing supply and communications system with the surface;

“work site” means the underwater location where work is performed.

## **PART 1 - GENERAL**

### **APPLICATION**

2. This Regulation applies to every owner, employer, constructor, supervisor and worker engaged in a diving operation for construction, industrial, mining, environmental, scientific or archaeological purposes and includes underwater inspection, excavation, alteration, repair or maintenance of equipment, machinery, structures, or ships and the salvage of sunken property and includes any function performed by surface workers, owners, constructors and employers in support of an underwater operation.

### **EQUIVALENCY**

3. An employer, owner or constructor may vary a procedure required by this Regulation or the composition, design, size or arrangements of a material, object or device or thing as required by this Regulation,
  - (a) if the procedure, composition, design, size or arrangement as varied, affords protection for the health and safety of workers that is at least equal to the protection that would otherwise be given; and
  - (b) if the employer, owner or constructor gives written notice prior to use of the varied procedure, composition, design, size or arrangement to the Director.

### **DUTIES OF EMPLOYERS, CONSTRUCTORS AND OWNERS**

4. The constructor of a project in which a diving operation is to take place and an employer and an owner who will be engaged in a diving operation shall before commencing an operation,

- (a) notify the Director by telephone, 48 hours before commencement or recommencement where practicable and confirm the notification by written statement to the Director stating,
  - (i) the municipal address of the diving operation or geographic location in relation to the closest public road or town,
  - (ii) the starting date and duration of the diving operation,
  - (iii) the name, mailing address and telephone numbers of the owner, constructor and employer,
  - (iv) the name of the diving supervisor in charge,
  - (v) the maximum depth of the diving operation,
  - (vi) the description of the diving operation,
  - (vii) the breathing mixture to be used, and
  - (viii) whether the diving operation is offshore or onshore;
- (b) notify the Director in writing before the use of mixed gas diving operations, a copy of which shall be available on the dive site for inspection;

**NOTE:** Notification forms for diving operations are available from Ministry of Labour offices.

- (c) notify in writing harbour masters, fire departments and upstream or adjacent industrial plants producing probable contamination, that a diving operation is to take place and the location thereof, a copy of which shall be available on the dive site for inspection;
- (d) appoint in writing a competent diving supervisor; and

- (e) set out in writing the operational procedures to be used on the diving operation and a contingency plan for emergencies, a copy of which shall be available on the dive site for inspection.

## **ACCIDENTS, NOTICES AND REPORTS**

5. (1) The employer shall ensure that a written report made under subsection 51(1) of the *Occupational Health and Safety Act* (the *Act*) representing an occurrence in which a person is killed or critically injured sets out,
  - (a) the name and address of the owner, constructor and employer, if the person involved is a worker;
  - (b) the nature and the circumstances of the occurrence and the bodily injury sustained by the person;
  - (c) a description of the machinery, equipment or procedure involved;
  - (d) the time and place of the occurrence;
  - (e) the name and address of the person involved;
  - (f) the names and addresses of all the witnesses to the occurrence;
  - (g) the name and address of the physician or surgeon, if any, by whom the person was or is being attended for the injury; and
  - (h) the steps taken to prevent a recurrence.
- (2) The employer shall ensure that a notice made under subsection 52(1) of the *Act* representing an occurrence involving a worker sets out,
  - (a) the name and address of the employer;
  - (b) the nature of the circumstances of the occurrence and the bodily injury or illness sustained by the worker;

- (c) a description of the machinery, equipment or procedure involved;
  - (d) the time and place of the occurrence;
  - (e) the name and address of the worker involved;
  - (f) the names and addresses of all witnesses to the occurrence;
  - (g) the name and address of the physician or surgeon, if any, by whom the worker was or is being attended for the injury or illness; and
  - (h) the steps taken to prevent a recurrence.
- (3) The employer shall ensure that a notice made under subsection 52(2) of the *Act* respecting a worker's illness sets out,
- (a) the name and address of the employer;
  - (b) the nature of the occupational illness;
  - (c) the name and address of the worker involved;
  - (d) the name and address of the physician or surgeon, if any, by whom the worker was or is being attended for the illness; and
  - (e) the steps taken to prevent a recurrence.
- (4) (a) An employer shall retain in the employer's permanent records, a record of any accident, explosion or fire involving a worker that causes injury requiring medical attention, but does not disable the worker from performing his/her usual work;
- (b) The record shall include particulars of,
- (i) the nature and circumstances of the occurrence and the injury sustained by the worker,

- (ii) the time and place of the occurrence,
  - (iii) the name and address of the injured worker,  
and
  - (iv) the steps taken to prevent a recurrence;
- (c) An employer to whom clause (a) applies shall make the record available to an inspector upon request.
- (5) Where a notice or report is not required under section 51 or 52 of the *Act*, a notice in writing shall be given to the Director within 2 days of any of the following diving related incidents,
- (a) a diver trapped underwater;
  - (b) a diver omitting decompression;
  - (c) failure of the life support system;
  - (d) emergency recovery of the submersible compression chamber or atmospheric diving system;
  - (e) use of recompression chamber for emergency purposes; and
  - (f) a worker becoming unconscious for any reason.

## **DUTIES OF SUPERVISORS**

6. (1) The diving supervisor shall have his/her diving log book at the dive site and available for inspection.
- (2) The diving supervisor shall be in direct control at the dive site and shall be in direct control of the diving operation.
- (3) Without limiting the generality of subsection (2), the diving supervisor shall,
- (a) establish a daily diving plan which shall be submitted in writing to the employer and have a copy posted at

the dive site for inspection prior to commencement of the diving operation;

- (b) advise the workers of the diving plan and of the emergency procedures that are to be followed in the event of a malfunction of the equipment or system;
- (c) ensure that the diver is competent to perform the work;
- (d) immediately before each dive, review the nature of the hazards in the work site and ensure that the diver fully understands the hazards involved as well as those likely to be encountered in the diving operation;
- (e) ensure that,
  - (i) all equipment and diving plant, including umbilical bundle, winches, cables, chambers and motors used in a diving operation are provided and maintained in good operating condition and examined daily by a competent person,
  - (ii) all manufacturer's operations manuals for all equipment are on site, updated and used where required,
  - (iii) there are a sufficient number of competent persons at the site,
  - (iv) breathing gas is free of contamination,
  - (v) the diving operation is conducted from a suitable place,
  - (vi) except in an emergency, each diver in the water shall have a separate diver's tender,
  - (vii) when diving operations are in progress, suitable warning devices are displayed to define the area to be kept clear of any

equipment other than that connected with the diving operation,

- (viii) a standby diver has been designated and is dressed-in at the dive site at all times when diving operations are in progress;
- (f) except in the case of accident or unavoidable circumstances, ensure that a diver is not permitted to remain at any depth longer than the maximum time planned for the depth of the dive;
- (g) supervise all diving decompression and therapeutic recompression in strict accordance with suitable decompression procedures and tables;
- (h) while acting as supervisor, not dive except in an emergency; and
- (i) terminate or interrupt the diving operation if, in the diving supervisor's opinion, continuance of the operation is likely to endanger the health or safety of any worker engaged in the operation and any operation contravenes the *Act* or Regulation.

## **DUTIES OF DIVERS**

7. (1) All divers shall ensure that they understand the daily dive plan, the operational plan and emergency procedures before commencing a dive.
- (2) Every diver shall have their log book at the dive site and available for inspection.
- (3) A diver shall not dive unless,
  - (a) the diver has undergone a medical examination as prescribed in subsection 26(1) and has submitted to the employer the written statement of the physician obtained in accordance with subsection 26(4);
  - (b) the diver is not fatigued;

- (c) the diver has not consumed alcohol or drugs which would impair his/her diving ability; and
  - (d) the diver is satisfied that all workers engaged in the work understand the daily dive plan, the operational plan, and the emergency procedures.
- (4) A diver shall inform the diving supervisor if he or she is unfit to dive.
- (5) Immediately before each dive, the diver shall check that all required equipment is in place and secured and all apparatus is functioning.
- (6) Before descent, the same check as that required in subsection (4) shall be conducted in the water by the diver.
- (7) The diver shall when possible, at the onset of any sign of malfunction of equipment or sign or symptom of distress, notify the diver's tender, the diving supervisor and any diving partner and terminate the dive.
- (8) On completion of any dive that does not require decompression, the diver shall remain under observation for a period as determined by the diving supervisor.
- (9) On completion of any dive requiring decompression, the diver shall remain under observation at the dive site for at least one hour and for a strenuous decompression dive, the diver shall remain under observation at the dive site for at least two hours.
- (10) A diver shall not fly for a period of twelve hours following a no-decompression dive, for a period of twenty-four hours following an air decompression dive, for a period of forty-eight hours following a mixed gas decompression dive, for a period of at least seven days following a saturation dive and for a period of at least six weeks following treatment for decompression sickness, and the maximum flying altitude shall be no greater than eight thousand feet above sea level for a period of at least twice the above designated times.

(11) A sturdy medical alert tag or bracelet displaying the words “Diver In An Emergency, Take To A Medical Facility”, shall be worn by each diver for at least twenty-four hours after completing each dive.

### **DUTIES OF STANDBY DIVERS**

8. In addition to complying with section 7, all standby divers shall ensure that they,
  - (a) are trained and equipped to operate at the depths and in the circumstances in which the submerged diver is operating;
  - (b) have all life-support and communication equipment tested and at hand, but not with helmet, face plate or mask in place;
  - (c) have an umbilical bundle or lifeline that is at least 3 metres (ten feet) longer than the umbilical bundle or lifeline of the diver, and of sufficient length to reach an operating diver in all cases;
  - (d) only enter the water in the event of an emergency;
  - (e) are positioned so as to be capable of rendering immediate emergency assistance at all times; and
  - (f) have their personal diving log book at the dive site and available for inspection.

### **DUTIES OF DIVER’S TENDERS**

9. (1) Except as permitted in section 24(1)(e), a diver’s tender shall, while working as a tender, devote his/her whole time and attention to the work as a tender.
- (2) Every diver’s tender shall be competent and knowledgeable in,
  - (a) the diving operation;

- (b) the apparatus being used;
- (c) the diving signals to be used;
- (d) in-water decompression procedures; and
- (e) diving emergency procedures.

## **PART II - EQUIPMENT**

### **DIVING EQUIPMENT – GENERAL**

10. (1) The employer and diving supervisor shall ensure that all diving equipment including breathing apparatus, compressors, compressed gas cylinders, gas control valves, pressure gauges, piping, helmets, winches, cables, chamber, submersibles, stages and all other accessories are,
  - (a) of sound construction, adequate strength, free from patent defects, and designed for its actual use;
  - (b) maintained in a condition that will ensure its continuing operating integrity and suitability for its actual use;
  - (c) protected against malfunction at low temperatures that may be caused by moist air;
  - (d) provided with complete and updated instructions, alerts, operating manuals and safety check-out procedures; and
  - (e) examined, tested, overhauled and repaired by a competent person in accordance with the manufacturer's recommended procedures.
- (2) Compressed gas cylinders shall be hydrostatically tested as required by the Canadian Transport Commission for its specific type and construction.

(3) Diving plant and equipment maintenance records shall be kept to record repairs and servicing of equipment and shall be dated and signed by the person performing these duties and shall be available at the dive site for inspection.

(4) The plant and equipment maintenance records shall be kept by the employer for a period of one year after the equipment is no longer in use.

### **PERSONAL DIVING EQUIPMENT**

11. The diver and diving supervisor shall ensure that the diver is equipped with,

- (a) a strong, sharp knife;
- (b) a diving harness;
- (c) suitable weights; and
- (d) an exposure suit or protective clothing appropriate for the condition of work.

### **SURFACE DIVING BASE EQUIPMENT**

12. (1) The diving supervisor shall ensure, when diving is in progress, a surface diving base is equipped with,

- (a) an adequate quantity of oxygen for therapeutic purposes;
- (b) one weighted manilla shot line of nineteen millimetres and of sufficient length to reach the bottom at the maximum depth of the work site;
- (c) first-aid kits suitable for the diving operation and locations;
- (d) one complete set of suitable decompression tables;
- (e) a heated facility for the use of workers that is located on or as near the dive site as possible;

- (f) a two-way communication system between the dive site and emergency services;
  - (g) a secondary source of power for the diving plant equipment and life support systems that can be rapidly brought on line in the event of failure of the primary energy source and is capable of powering the handling systems, maintaining heating to the diving system, sustaining life-support systems and illuminating the work and dive sites; and
  - (h) such other equipment as may be required to protect the health and safety of the worker.
- (2) The employer and diving supervisor shall ensure that all offshore surface diving bases are equipped with,
- (a) a secondary means of propulsion; or
  - (b) a secondary means of transporting an injured diver.
- (3) The employer shall ensure that,
- (a) when the diving operation is to be conducted from a vessel or structure, it is of sufficient size to accommodate all workers, plant and equipment without overcrowding, and is equipped with a means to facilitate immediate entry and exit from the water of a diver or unconscious diver; and
  - (b) a vessel that is used in a diving operation is capable of being anchored, moored or maintain station without risk to the diver during diving operations.

## **LIFELINES**

13. The diving supervisor shall ensure that lifelines,

- (a) are free from defect, maintained in a condition that will ensure their continuing operating integrity and are free of knots and splices and have a breaking strength of not less than 2545 kilograms (5400 pounds);

- (b) are worn at all times by a diver and by a standby diver;
- (c) are securely attached to the diver's harness;
- (d) are no longer than is required to perform the work;
- (e) are secured at the surface to a point of anchorage;
- (f) are secured in a manner that will prevent loss of contact with the diver;
- (g) are tended at all times by a diver's tender or tethered to an identifiable float located at the surface; and
- (h) are incorporated in any umbilical bundle and attached in a suitable manner to prevent stress on the hose.

## **COMMUNICATIONS**

14. (1) Subject to subsection (b), the employer and diving supervisor shall ensure that,
- (a) a two-way effective communication system by voice or by prearranged line signals is provided between every submerged diver and surface support personnel; and
  - (b) the two-way communication provided between the submerged diver and surface support personnel shall be by voice when the depth of the dive exceeds or is intended to exceed thirty metres (100 feet) or when a planned dive includes decompression or special or exceptional hazards.
- (2) The employer and diving supervisor shall ensure that a voice communication provides,
- (a) sound reproduction that enables the diver's breathing to be clearly heard;

- (b) a means of voice unscrambling when breathing mixtures containing helium or other gases that significantly distort sound transmission are being used; and
  - (c) a recording system for voice communications for depths exceeding fifty metres (165 feet).
- (3) The employer and diving supervisor shall ensure that in addition to the primary communications system required in subsection (1) an emergency backup is established.

## **HOISTING DEVICES**

15. (1) The supervisor shall ensure that,
- (a) a hoisting device used to lower a stage, wet bell, submersible compression chamber, submersible or atmospheric diving system is not used for any other purpose until after the completion of the dive;
  - (b) all directions to the operator of the hoisting device are given by the diver, the diver's tender or the diving supervisor, and the signal to stop can be given by any person;
  - (c) the diver is in continuous visual contact with the diving supervisor by the use of prearranged visual signals; or
  - (d) the diver is in contact with the diving supervisor by the use of a voice communication system.
- (2) The employer shall ensure that any hoisting device used in the diving operation to raise or lower a stage, wet bell, submersible compression chamber, submersible, or atmospheric diving system is so constructed that,
- (a) a brake or mechanical locking device is applied when the control lever, handle or switch is not held in the operating position;

- (b) the brakes have the capability of stopping and holding a hundred per cent of the maximum working load with the outermost layer of wire on the drum;
  - (c) the brakes engage automatically on loss of power;
  - (d) the lowering and raising of loads is controlled by power drives independent of the brake mechanism;
  - (e) it is not fitted with a pawl-and-ratchet gear on which the pawl has to be disengaged before commencing a lowering or raising operation;
  - (f) to prevent the possibility of freeze-up; and
  - (g) it is of sound construction, adequate strength, free from patent defects and designed for its actual use.
- (3) The employer and diving supervisor shall ensure that the hoisting device is equipped with a lifting cable capable of withstanding a functional test in accordance with a suitable standard.

### **STAGES AND WET BELLS**

16. (1) The employer and diving supervisor shall ensure that stages and wet bells,
- (a) are large enough to carry at least two divers with their diving equipment and associated equipment in uncramped conditions;
  - (b) are secure against tipping and spinning;
  - (c) do not contain any equipment that might interfere with an occupant's foothold or handhold;
  - (d) are so constructed or equipped that the occupants are secure against falling out of the stage or wet bell;
  - (e) are equipped with hand holds arranged in such manner that crushed-hand injuries during launch or recovery are avoided;

- (f) have a secondary lifting eye or similar device that is of at least the same strength as the primary lifting eye;
  - (g) have an additional cable in the form of a tag rope, so designed, that in the event that the primary lifting cable breaks during the water–air interface transfer, the tag rope will not permit the wet bell or stage to descend to a depth greater than 25 metres (approx. 80 feet);
  - (h) have readily available, for use in emergency, a secondary emergency lifting cable that has at least the same strength as the primary lifting cable and that is compatible with secondary lifting eye or similar device; and
  - (i) are designed for the purpose for which they are to be used.
- (2) In addition to subsection (1), the employer shall ensure a wet bell is provided with,
- (a) an adequate emergency breathing gas for the decompression of divers in an emergency; and
  - (b) a voice communication system which allows contact with the diving supervisor.

## **HYPERBARIC CHAMBERS**

17. (1) The employer shall ensure that all hyperbaric compression chambers conform to the requirements of the Canadian Standards Association Standard, Z275.1, “Hyperbaric Facilities”, and are registered with the Ministry of Consumer and Commercial Relations, Boiler and Pressure Vessels Branch, for use in Ontario.
- (2) Subject to subsection (3), the employer and diving supervisor shall ensure that a hyperbaric chamber, Class A of a double lock type in operable condition is on site where a diving operation exceeds,
- (a) the no–decompression limit; or

- (b) a depth of thirty metres (100 feet).
- (3) The employer and diving supervisor shall ensure that a hyperbaric chamber is on site regardless of depth or decompression limits where it is reasonable in the circumstances for the protection of the diver.
- (4) The employer and diving supervisor shall ensure that,
  - (a) a hyperbaric chamber is equipped with suitable fire extinguishment;
  - (b) where practicable, sources of hyperbaric chamber illumination are mounted outside the pressure hull, and arranged so that the light is transmitted to the interior by fibre optic techniques;
  - (c) where externally mounted lamps are employed for illumination of hyperbaric chambers through view ports, they are of a design suitable for the environment and purpose, and are installed to prevent the view ports from overheating during use; and
  - (d) when a breathing mixture with the per cent of oxygen greater than 21% is used in the hyperbaric chamber, the chamber is,
    - (i) equipped with a built in breathing system (BIBS), which exhausts respired breathing gas out of the chamber through a regulating device, and
    - (ii) equipped with an oxygen monitoring device.

### **MAINTENANCE OF GAUGES AND METERING EQUIPMENT**

18. The employer and diving supervisor shall ensure that,
- (a) gauges and metering equipment are checked at least once every six months or whenever a discrepancy is indicated; and

- (b) any malfunction of a gauge or metering equipment is rectified immediately or the gauge or equipment is removed from service and tagged "Do Not Use, To Be Repaired Or Calibrated".

## **PART III - BREATHING MIXTURES**

### **GENERAL REQUIREMENTS**

- 19. (1) The diving supervisor shall ensure that a diver is not given pure oxygen for breathing except for decompression or therapeutic purposes.
  - (2) The employer and diving supervisor shall ensure that a diving operation is not undertaken unless the breathing mixture supply system is designed to ensure that,
    - (a) an interruption of the breathing mixture supply to a diver will not affect the supply of breathing mixture to any other diver; and
    - (b) a failure of the primary breathing mixture supply to a diver will not affect the supply of breathing mixture from the diver's bail-out bottle or reserve.

### **QUANTITIES OF BREATHING MIXTURES**

- 20. (1) The diving supervisor shall ensure that a total quantity of appropriate breathing mixture that is available at any time during the diving operation consists of,
  - (a) an adequate quantity to complete the diving operation; and
  - (b) an additional, emergency reserve supply that,

- (i) in the case of a diving operation in which S.C.U.B.A. is used, one complete set of S.C.U.B.A. with regulator attached and a fully charged cylinder with a minimum of 2.04 cubic metres (73 cubic feet), that is immediately available for each S.C.U.B.A. diver, and S.C.U.B.A. standby diver,
- (ii) in the case of a diving operation in which surface supplied techniques are used, is 2.5 times greater than that required for the operation,
- (iii) in the case of a diving operation in which a submersible compression chamber is used, is of a sufficient quantity to meet the needs of the occupants of the chamber for a minimum of seventy-two hours,
- (iv) in the case of a diving operation in which a lock-out submersible or an atmospheric diving system is used, is of a sufficient quantity to meet the needs of the occupants of the submersible or atmospheric diving system for a minimum of seventy-two hours,
- (v) in the case of a diving operation in which an on-line gas blender or diver's gas recovery system is used, is of a sufficient quantity to allow the divers to continue, to interrupt or discontinue the diving operation, and
- (vi) in the case of a diving operation in which a surface compression chamber is used, a quantity that is twice the amount required to pressurize the surface compression chamber to a pressure equivalent to the pressure at the greatest depth, or a minimum of fifty metres (165 feet), in respect of which the surface compression chamber will be used, and an adequate quantity of therapeutic breathing mixture.

- (2) The diving supervisor shall ensure that the breathing mixture is available for immediate use at a flow rate, temperature and pressure as required by the diver for the depth and circumstances of the dive.

### **BAIL-OUT SYSTEMS**

21. The diving supervisor and diver shall ensure that,
- (a) a suitable breathing mixture is in the bail-out system with an adequate quantity for the operation being undertaken; and
  - (b) the total quantity of the breathing mixture in the bail-out system is,
    - (i) when carried by the diver, sufficient to enable the diver to reach the surface, submersible compression chamber, lock-out submersible or the wet bell and undergo decompression, and
    - (ii) when carried by the standby diver, sufficient to reach the diver and return to the surface, submersible compression chamber, lock-out submersible or the wet bell and undergo decompression.

### **MIXED BREATHING GASES**

22. The employer and diving supervisor shall ensure that when gases mixed in proportions other than the normal proportions of respirable air are used, techniques and decompression procedures suitable for the mixture are employed.

### **PURITY OF BREATHING MIXTURES**

23. The employer and diving supervisor shall ensure that the purity of the breathing mixture conforms to the Canadian Standards Association Standard, Z275.2.

## **COMPRESSOR REQUIREMENTS**

24. (1) The employer and diving supervisor shall ensure that,

- (a) compressors and associated equipment used to supply breathing gas or air conform to the requirements of the Canadian Standards Association Standard “B-51 Code for the Construction and Inspection of Boilers and Pressure Vessels”;
- (b) compressed air supplied to a diver meets the requirements of the Canadian Standards Association Standard, Z180.1 “Compressed Breathing Air”;
- (c) compressors used to supply breathing air to divers are capable of maintaining a supply of air equal to, at least double the volume of air, and at an air pressure 25 per cent greater than the maximum pressure required by the dive profile, apparatus used and operate automatically and without fluctuation of pressure in the air-tank receiver;
- (d) compressors supplying breathing gas or air to divers discharge the gas or air through purification filters into a tank or receiver of suitable volume; and
- (e) compressors are operated by a competent person, who may be the diver’s tender.

(2) The operator of the compressor shall ensure,

- (a) that all equipment used to supply a quantity of air or breathing mixture to the diver, as required by the dive profile and apparatus used, is in good working order; and
- (b) that all associated equipment including valves, stop valves, drain-cocks, gauges and filters are operating adequately.

## **OXYGEN SUPPLY SYSTEMS**

25. (1) The employer and diving supervisor shall ensure that oxygen supply systems are designed for the purpose for which they are to be used, and are constructed to ensure that,
- (a) hoses and piping are kept to a minimum;
  - (b) all materials are compatible with the pressures and temperatures for which the system is designed;
  - (c) the possibility of contamination of the oxygen by hazardous elements or by other gases and the other gases by oxygen is minimized;
  - (d) high-velocity flows of oxygen are avoided;
  - (e) the differential pressures throughout the oxygen supply system are kept as low as is practicable; and
  - (f) quick-opening valves such as ball valves are not used in oxygen systems, except for emergency shut-off at the point of penetration of a hyperbaric chamber hull.
- (2) The employer and diving supervisor shall ensure that the oxygen supply system has been cleaned and certified in accordance with the manufacturer's specifications and procedures, by a competent worker.
- (3) The employer and diving supervisor shall ensure that an area where oxygen is stored is,
- (a) adequately ventilated;
  - (b) identified with warning signs;
  - (c) equipped with a fire suppression system; and
  - (d) kept clean and located as far as practicable from combustible materials.

## **PART IV - MEDICAL PROCEDURES**

### **DIVING MEDICALS**

26. (1) Every diver, with the exception of atmospheric diving systems operators, shall undergo a medical examination annually or such shorter period as is specified by the examining physician.
- (2) A diver shall undergo a medical examination where the diving supervisor has reason to believe that the diver is unfit to dive or where there are special hazards that the diving supervisor has reason to believe may endanger the health of a diver.
- (3) The diver and diving supervisor shall ensure that medical examinations required under subsection (1) or (2) meet the requirements of the Code for Medical Examination of Divers, appendix to this regulation.
- (4) The diver shall ensure that he or she has available for inspection, a written statement from a physician certifying, that the examination was conducted in accordance with the Regulation Code for Medical Examination of Divers, and indicating whether the diver is fit, fit with limitations or unfit for diving.

### **EVIDENCE OF EMERGENCY TRAINING**

27. The employer and diving supervisor shall ensure that every supervisor, diver and at least one worker stationed at the surface is trained and maintains certification in cardio-pulmonary resuscitation, basic first aid, and the emergency treatment of diving ailments, and has such certification recorded in his/her logbook.

## **EMERGENCY AND MEDICAL ASSISTANCE**

28. (1) The employer shall,
- (a) arrange for a physician, who is knowledgeable in the aspects of diving medicine and with the procedures to be used in the diving operation, to provide medical assistance in the event of an emergency;
  - (b) arrange for suitable means of communication, on a twenty-four hour basis, between the dive site and the physician; and
  - (c) have a contingency plan for the immediate evacuation of an injured diver to a medical hyperbaric treatment facility in the event of an emergency.
- (2) The employer shall ensure that where deep diving or remote diving operations are conducted, one member of the diving team is,
- (a) trained as a medical attendant to divers; and
  - (b) available to provide immediate assistance in the event of an emergency.

## **BACK-UP HYPERBARIC FACILITIES**

29. The employer shall identify the location of the nearest back-up hyperbaric facility and shall make arrangements, confirmed in writing, for the use of this facility in the event of a diving emergency.

## **DECOMPRESSION PROCEDURES AND TABLES**

30. The diving supervisor shall ensure that diving operations and therapeutic treatments of divers are carried out in strict accordance with the suitable decompression procedures and tables.

## **PART V - S.C.U.B.A. DIVING**

### **APPLICATION**

31. (1) This part applies to diving operations in which a diver uses S.C.U.B.A.
- (2) The employer shall ensure that where S.C.U.B.A. that provides other than normal air mixtures or recirculating apparatus is used on a diving operation, written notice is given to the Director, a copy of which shall be available on the dive site for inspection, and the diver is competent and trained in the use and hazards of this equipment.
- (3) The diving supervisor shall ensure that,
- (a) S.C.U.B.A. is not used for diving operations involving underwater intakes, the entry into pipes or confined spaces, under ice, liveboating, or water control structures; and
- (b) S.C.U.B.A. is not used on construction projects except for the purpose of underwater inspections.

### **MINIMUM CREW**

32. Subject to clause (b) the employer and diving supervisor shall ensure that,
- (a) a sufficient number of workers are present for each diving operation to ensure, so far as is reasonably practical, that the operation can be undertaken safely; and
- (b) a minimum of three workers are present at each dive site, one of whom is a diver, one a standby diver and one a diver's tender.

### **LIFELINES**

33. The diving supervisor shall ensure that a diver using S.C.U.B.A. uses a lifeline tended at the surface or tethered to an identifiable float located on the surface and visually monitored from a location that allows for immediate assistance to be rendered to the submerged diver in the event of an emergency.

### **MAXIMUM DEPTH**

34. The diving supervisor shall ensure that a S.C.U.B.A. diver does not dive to depths greater than thirty metres (100 feet).

### **S.C.U.B.A. DIVING EQUIPMENT**

35. The diver and the diving supervisor shall ensure that a diver using S.C.U.B.A. shall, for each dive, use or wear the equipment listed in section 10 (Personal Diving Equipment) and,
- (a) except where a S.C.U.B.A. mentioned in subsection 31(2) is used, an open circuit S.C.U.B.A. complete with demand regulator and tank with quick release harness;
  - (b) a face mask;
  - (c) a pair of fins;
  - (d) a submersible pressure gauge; and
  - (e) a diver's indicator device such as a rescue beacon or strobe where S.C.U.B.A. diving operations are to be carried out during the hours of darkness.

**NOTE:** Clause 6.8 of the Canadian Standards Association Standard Z275.2 Occupational Safety Code for Diving Operations, includes additional equipment – snorkel, buoyancy compensator, and underwater watch, which are considered optional equipment that may be worn by the diver.

## **TESTING CYLINDERS**

36. The employer shall ensure that,

- (a) each S.C.U.B.A. cylinder is hydrostatically tested as required by the Canadian Transport Commission, for its specific type and construction; and
- (b) at least once a year each S.C.U.B.A. cylinder is visually inspected internally and externally by a competent person.

**NOTE:** S.C.U.B.A. cylinders should be cared for and stored in a manner recommended in Canadian Standards Association Standard, Z180.1 (Compressed Breathing Air).

## **PART VI - SURFACE-SUPPLIED DIVING**

### **APPLICATION**

37. This part applies to surface-supplied diving.

### **MINIMUM CREW**

38. Subject to clauses (b) and (c) the employer and diving supervisor shall ensure that,

- (a) a sufficient number of workers are present for each diving operation to ensure, as far as reasonably practical, the operation can be undertaken safely;
- (b) where the planned depth does not exceed thirty metres (100 feet), a minimum of three workers are present for each diving operation, of whom one is a diver, one a standby diver, and one a diver's tender; and

- (c) where the planned depth exceeds thirty metres (100 feet), a minimum of four workers are present for each diving operation, of whom one is a diver, one a standby diver, one a diving supervisor and one a diver's tender.

### **SURFACE-SUPPLY DIVING EQUIPMENT**

39. The diver and diving supervisor shall ensure that a diver using surface-supplied diving apparatus, for each dive, uses or wears the equipment listed in section 10 (Personal Diving Equipment).

### **BREATHING GAS LINES**

40. (1) The diving supervisor shall ensure that stationary air or mixed gas lines are safeguarded against damage or interference.
- (2) The employer and diving supervisor shall ensure that a valve is fitted in each diver's air or mixed gas line, which valve shall be,
- (a) readily accessible;
  - (b) guarded against interference;
  - (c) clearly marked to identify the diver whose air or mixed gas supply it controls; and
  - (d) under the care and control of a competent person.
- (3) The employer and diving supervisor shall ensure that,
- (a) a pressure gauge is provided to indicate the air or mixed gas mixture being delivered to the diver;
  - (b) the pressure gauge is installed in such a position that its dial and figures are in the clear and unobstructed view of the diver's tender;

- (c) the pressure gauge is installed downstream of the diver's supply valve except where the diver's supply valve is a position indicating valve;
- (d) all hoses, pipes, couplings and other fittings in use in any air or mixed gas supply lines for divers are designed and suitable for their intended use; and
- (e) hoses are kink resistant and capable of sustaining the required flow rates and pressures for the system used.

### **HELMETS, MASKS AND HOOKAH**

41. The employer and diving supervisor shall ensure that a diver who undertakes surface-supplied diving operations, for each dive, uses or wears a surface-supplied diving helmet, full face mask or hookah system designed and suitable for such work and fitted with,
- (a) a fully functioning non-return valve, which shall be checked before the commencement of diving operations in accordance with the written instructions of the manufacturer;
  - (b) a locking or fastening device;
  - (c) where applicable, a suit inflation device that is not operated from the diver's bail-out bottle;
  - (d) a compatible attachment system for mating of the exposure suit to the helmet;
  - (e) a suitable bail-out system; and
  - (f) an effective two-way communications system.

### **LIFELINES**

42. The employer and diving supervisor shall ensure that a diver using surface supplied equipment has a lifeline incorporated into his/her umbilical bundle in a suitable manner to prevent stress on the hose and such umbilical bundle shall be tended at the surface.

## PART VII - DEEP DIVING

### APPLICATION

43. This part applies to diving operations conducted to depths deeper than fifty metres (165 feet).

### GENERAL REQUIREMENTS

44. (1) The employer and diving supervisor shall ensure that the diver,
- (a) is tethered to the dive site by an umbilical bundle; and
  - (b) is provided with effective two-way voice communication.
- (2) The employer and diving supervisor shall ensure that mixed gas, suitable for the depth and duration of the dive, is used as the breathing mixture in deep diving operations except during one-atmosphere diving operations, in which air shall be used for breathing.
- (3) The employer and diving supervisor shall ensure that a deep diving operation is not carried out unless,
- (a) the divers are transported from the dive location to the underwater work site by a suitable stage, submersible compression chamber, wet bell lock-out submersible or atmospheric diving system;
  - (b) the standby diver is located,
    - (i) at the discretion of the diving supervisor, at the surface, on a stage or in a wet bell, or
    - (ii) where a submersible compression chamber is used, in the chamber;
  - (c) every diver and standby diver is in voice communication with the diving supervisor;

- (d) the diving supervisor at the dive site has a means of,
  - (i) monitoring the depth of the diver,
  - (ii) controlling the pressures of the breathing mixtures being supplied to each diver and the standby diver, and
  - (iii) continuously analyzing the breathing mixtures;
- (e) each submerged diver is tended by a diver's tender who is,
  - (i) located at the surface, on a stage or in a wet bell, or
  - (ii) if a submersible chamber is used, is in the chamber;
- (f) where a submersible compression chamber is used, at least one diver remains in the chamber to monitor the diver who has left the chamber.

## **DEEP DIVING EQUIPMENT**

### **SUBMERSIBLE COMPRESSION CHAMBERS**

45. The employer and diving supervisor shall ensure that all submersible compression chambers conform to the requirements of the Canadian Standards Association Standard Z275.1, "Hyperbaric Chambers Facilities", is registered with the Ministry of Consumer and Commercial Relations, Boiler and Pressure Vessels Branch, for use in Ontario, and,
- (a) is equipped to permit the transfer of persons under pressure into and from a surface compression chamber;
  - (b) is of design that,

- (i) allows at least two divers that are equipped and dressed for the diving operation to be seated in an uncramped position within,
  - (ii) allows divers to enter and exit without difficulty,
  - (iii) in case of an emergency, allows a diver within to disconnect or shear the primary lifting cable and the umbilical bundle;
- (c) is used in association with lifting gear that enables the chamber to be lowered to the depth at which the diving operation is to be carried out, without excessive lateral, vertical or rotational movement taking place;
- (d) is provided with a means whereby, in the event of a failure of the main lifting gear, the chamber can be returned to the surface and, where such means involves the shedding of weights, the controls for such shedding shall be capable of operation from within the chamber, and a means shall be incorporated to prevent accidental shedding of these weights;
- (e) is provided, in addition to a primary lifting cable, with a tag rope so designed that, in the event the primary cable breaks during an air–water interface transfer, the tag rope will not permit the chamber to descend to a depth greater than 25 metres (approx. 80 feet);
- (f) is provided with a secondary lifting eye or similar device that is at least the same strength as the primary lifting eye, and is provided with a secondary lifting cable that is readily available and that has at least the same strength as the primary lifting cable and is compatible with the secondary lifting eye or similar device; and
- (g) is equipped with suitable,

- (i) doors and hatches that act as pressure seals and may be opened from either side,
- (ii) valves, gauges and other fittings as are required to control the internal pressure, and to clearly indicate the internal and external pressures inside and outside the chamber,
- (iii) pressurization valves that are spring loaded so as to close when not held in the open position,
- (iv) equipment including reserve facilities for supplying the breathing mixture to persons occupying or working from the chamber, which reserve facilities shall be protected against inadvertent operation and be capable of being brought on line from within the submersible compression chamber without outside assistance,
- (v) a two-way voice communication system including an emergency back-up system, by which a person inside the submersible compression chamber can communicate with the diving supervisor of the diving operations, and via the supervisor, with other persons, and be fitted with a device to continuously record and save the previous four hours of communication,
- (vi) lighting equipment including emergency back-up illumination,
- (vii) first aid equipment,
- (viii) a hoisting device to recover an unconscious or injured diver into the chamber,
- (ix) heating equipment,
- (x) emergency thermal protection for all occupants,

- (xi) a diver's umbilical bundle which shall be limited to thirty metres (100 feet),
- (xii) a standby diver's umbilical bundle which shall be three metres (10 feet) longer than the diver's umbilical bundle,
- (xiii) a stroboscope light that is automatically activated in the water,
- (xiv) an emergency locating device,
- (xv) instruments to monitor temperature, oxygen and carbon dioxide levels within the submersible compression chamber,
- (xvi) primary and emergency carbon dioxide scrubbers, and
- (xvii) hull integrity valves and non-return valves on all gas and hot-water penetrations into the submersible compression chamber.

## **LOCK-OUT SUBMERSIBLES AND ATMOSPHERIC DIVING SYSTEMS**

46. (1) The employer and diving supervisor shall ensure that the pressure hulls of lock-out submersibles and atmospheric diving systems and the compression chamber of a lock-out submersible conforms to the requirements of the Canadian Standards Association Standard Z275.1 ("Hyperbaric Facilities") and is registered with the Ministry of Consumer and Commercial Relations, Boiler and Pressure Vessels Branch, for use in Ontario and,
- (a) is equipped to permit the transfer of persons under pressure into and from a surface compression chamber;
  - (b) is of a design that,
    - (i) allows at least two divers that are equipped and dressed for the lock-out diving operation to be seated in an uncramped position within,

- (ii) allows divers to enter and exit without difficulty, and
  - (iii) in case of an emergency, allows an operator within to disconnect or shear the primary lifting cable and umbilical bundle.
- (2) The diving supervisor shall ensure that a lock-out diving operation is not carried out from a submersible unless,
  - (a) the lock-out diver's umbilical bundle is limited to thirty metres (100 feet); and
  - (b) the umbilical bundle of the standby diver is three metres (10 feet) longer than the umbilical bundle of the lock-out diver.
- (3) The employer and diving supervisor shall ensure that lock-out submersible or atmospheric diving operations are not conducted unless the submersible or atmospheric diving system is,
  - (a) provided with a means whereby, in the event of a failure of the main lifting gear, the submersible or atmospheric diving system can be returned to the surface and, where such means involves the shedding of weights, the controls for such shedding are capable of operation from within, and a means is incorporated to prevent accidental shedding of these weights;
  - (b) provided with a secondary lifting eye or similar device that is at least the same strength as the primary lifting eye;
  - (c) provided with a secondary lifting cable that is readily available and that has at least the same strength as the primary lifting cable and is compatible with the secondary lifting eye or similar device; and
  - (d) equipped with suitable,

- (i) doors and hatches that act as pressure seals and may be opened from either side,
- (ii) valves, gauges and other fittings as required to control the internal pressure and to clearly indicate the internal and external pressures inside and outside the submersible or atmospheric diving system,
- (iii) pressurization valves that are spring loaded so as to close when not held in the open position,
- (iv) equipment including reserve facilities for supplying the breathing mixture to persons occupying or working from the lock-out submersible or atmospheric diving system, which reserve facilities shall be protected against inadvertent operation and be capable of being brought on line from within, without outside assistance,
- (v) a two-way voice communication system including an emergency back-up system, by which a person inside the submersible or atmospheric diving system can communicate with the diving supervisor, and via the supervisor, with other persons, and be fitted with a device to continuously record and save the previous four hours of communication,
- (vi) lighting equipment including emergency back-up illumination,
- (vii) first aid equipment,
- (viii) a hoisting device to recover an unconscious or injured diver into a submersible's compression chamber,
- (ix) heating equipment,
- (x) emergency thermal protection for all occupants,

- (xi) a stroboscope light that is automatically activated in the water,
- (xii) an emergency locating device,
- (xiii) instruments to enable occupants to monitor the temperature, oxygen and carbon dioxide levels within the submersible or atmospheric diving system,
- (xiv) primary and emergency carbon dioxide scrubbers, and
- (xv) hull integrity valves and non-return valves on all gas and hot-water penetrations into the submersible or atmospheric diving system.

## **BOUNCE DIVING OPERATIONS**

47. The diving supervisor shall ensure that,

- (a) where bounce diving techniques are used in a deep diving operation, no diver remains submerged for a total period of time in excess of three hours in a twenty-four hour period, and that there is a rest period of at least twenty-four continuous hours after this limit has been reached;
- (b) a diving operation using bounce diving techniques is carried out at depths greater than fifty metres and for a maximum bottom time greater than forty minutes *only* if a submersible compression chamber or lock-out submersible capable of mating to a Class A (double-lock type) hyperbaric chamber for the transfer of personnel under pressure to and from the work site is provided; and
- (c) a diving operation using bounce diving techniques is carried out at depths greater than seventy metres *only* if a submersible compression chamber or lock-out submersible is used capable of mating to a

Class A (double-lock type) hyperbaric chamber for the transfer of personnel under pressure to and from the work site is provided.

### **SATURATION DIVING OPERATIONS**

48. Where saturation diving techniques are used in a deep diving operation, the diving supervisor shall ensure that,
- (a) where the dive is up to a depth of one hundred and fifty metres (approx. 490 feet), no diver exceeds four hours in the water and four hours as attendant in the submersible compression chamber;
  - (b) where the dive is deeper than one hundred and fifty metres (approx. 490 feet), no diver exceeds three hours in the water and three hours as attendant in the submersible compression chamber;
  - (c) in any twenty-four hour period, there is a rest period of at least twelve continuous hours after the time limits specified in clause (a) or (b) have been reached; and
  - (d) a diver shall not commence another dive within fourteen days of completion of decompression following a saturation dive unless authorized by a physician.

### **LOCK-OUT SUBMERSIBLE AND ATMOSPHERIC DIVING OPERATIONS**

49. (1) The diving supervisor shall ensure that a lock-out diving operation shall not be conducted from a submersible unless,
- (a) the submersible is negatively buoyant on the bottom or positively secured to the work site;
  - (b) the diving supervisor is on board the submersible and present in the one-atmosphere chamber during the lock-out operation; and

- (c) a standby diver/tender is monitoring the lock-out operation from the submersible's compression chamber and dressed and equipped to immediately carry out rescue operations in the event of an emergency.
- (2) The employer and diving supervisor shall ensure that lock-out submersible or atmospheric diving operations are not conducted unless,
  - (a) a back-up unit with sufficient depth capabilities to effect a rescue is located and arrangements are made for its use in the event of an emergency;
  - (b) the on-board life-support system of the submersible or atmospheric diving system is capable of sustaining life for a period of time that would enable the back-up unit to reach the site of the diving operation and conduct rescue operations; and
  - (c) the employer has provided written contingency procedures outlining methods of dealing with,
    - (i) deteriorating weather and/or ice conditions during a dive,
    - (ii) the inability of the surface craft to maintain station,
    - (iii) failure of any major component of diving plant and equipment, and
    - (iv) any other hazard that may reasonably be anticipated.

### **DEEP DIVING CREW**

- 50. (1) The employer and diving supervisor shall ensure that for all deep diving operations there is a sufficient number of competent persons to,
  - (a) operate the diving plant and equipment and other facilities while any diver, lock-out submersible or atmospheric diving system is under, entering or leaving the water; and

- (b) operate any hyperbaric chamber and associated equipment required for the deep diving operation.
- (2) In addition to the requirements of clauses (1)(a) and (b), the employer and diving supervisor shall ensure that during deep diving operations where,
  - (a) bounce diving techniques are used, a minimum of five workers are present of whom one shall be a diving supervisor, two shall be divers and two shall be tenders; and
  - (b) saturation diving techniques are used, a minimum of ten workers are present of whom two shall be diving supervisors, two saturation divers, two life-support technicians, two systems operators and two shall be tenders.
- (3) The diving supervisor shall ensure that a standby diver is present at the surface during all deep diving operations.
- (4) The employer and diving supervisor shall ensure that when more than one lock-out deep diving operation in a twenty-four hour period is planned, there is a sufficient number of competent crew to ensure that the diver and standby diver have not been exposed to pressure for a twenty-four hour period before commencing a dive.

## **PART VIII - SPECIAL HAZARDS**

### **LIVEBOATING**

51. (1) The employer and diving supervisor shall ensure that liveboating from a surface vessel is not conducted,
- (a) at night;
  - (b) in rough seas;
  - (c) from vessels with insufficient manoeuvrability; and

- (d) while using S.C.U.B.A.
- (2) The diving supervisor shall ensure that when liveboating from a surface vessel is to be conducted, decompression diving procedures are not permitted.
- (3) The employer and diving supervisor shall ensure that a procedure or device that prevents the diving umbilical bundle from becoming entangled in the propellers is employed during a liveboating operation.
- (4) The diving supervisor shall ensure that the diver's tender for a liveboating operation is competent to perform this type of tending, is in contact with the diver at all times by means of a voice communication system and is in a position of unobstructed view of the vessel's captain.
- (5) The employer shall ensure that a boat captain,
  - (a) is competent to perform the duties of a captain in a liveboating operation; and
  - (b) carries out his/her responsibilities as ship's captain in cooperation with the direct control duties of the diving supervisor with regard to the diving operation.
- (6) Termination of a liveboating operation shall be initiated at any time by the boat captain, diving supervisor, diver's tender, diver or standby diver in the event of an emergency.

## **UNDERWATER INTAKES AND PIPES**

- 52. (1) The diving supervisor shall ensure that,
  - (a) prior to a diver approaching any underwater intake, pipe, tunnel, duct, or water control structure, the presence of any flow is located and identified in such a manner as to differentiate it from any other similar location or structure in the area;

- (b) the diver does not approach any intake until the flow through it is stopped and locked out in a manner satisfactory to the diver and diving supervisor and provisions are made so that the flow shall not be re-established until the diver leaves the water;
  - (c) facilities such as head gates, stop logs or turbine and pump intake gates are used for the protection of the diver when work is conducted near penstocks, turbines or pump intakes or in draft tubes;
  - (d) where an equipment lock-out procedure is used, the removal of the lock-out mechanism is only performed by the diving supervisor; and
  - (e) where a diving operation is performed in a location in which the water current exceeds 1.5 knots, the velocity of the flow is determined.
- (2) The employer shall ensure that, where a diving operation is to be performed in water in which the velocity of the current exceeds 1.5 knots, a notice of the dive and the water velocity is given to the Director prior to conducting the diving operation, a copy of which shall be available on the site for inspection.

## **UNDERWATER MECHANISMS**

53. The diving supervisor shall ensure that before a diver approaches a location that may be made hazardous by the operation of mechanisms, such mechanisms are,
- (a) secured against inadvertent movement before the diver enters the water; and
  - (b) locked-out in a manner satisfactory to the diver and the diving supervisor and suitable to protect the safety of the diver.

## **USE OF EXPLOSIVES**

54. The employer and diving supervisor shall ensure that,
- (a) where high explosives or blasting agents are to be handled during a diving operation, the explosive is transported, handled, used and stored in accordance with federal regulations and in a manner that will not endanger the worker;
  - (b) the initiation of all explosives is under the direct control of the diving supervisor;
  - (c) the blasting machine and its operating key or mechanism are kept physically separated from each other until initiation of the explosive is to take place; and
  - (d) a diver is not in the water when an underwater explosive is initiated.

## **EXCEPTIONAL HAZARDS**

55. (1) The employer and diving supervisor shall ensure that where exceptional hazards exist or are predicted, a second diving crew, with independent equipment, is on the site of the diving operation to effect a rescue.
- (2) Exceptional hazards include,
- (a) an exceptional risk of entrapment of a diver;
  - (b) an exceptional environmental, physiological or workplace hazard to a diver; and
  - (c) an exceptional risk of loss of the diver's essential life-support system.

## PART IX - DIVING RECORDS

### DIVER'S PERSONAL LOGBOOK

56. (1) A diver shall maintain a logbook that,
- (a) is permanently bound;
  - (b) has numbered pages;
  - (c) contains the diver's signature and photograph; and
  - (d) contains any factor relevant to the diver's safety or health.
- (2) Divers shall retain their personal logbook for five years after its completion.
- (3) Divers shall have their personal logbook at the dive site and available for inspection.
- (4) Divers shall have entered in or attached to their personal logbook,
- (a) a record of any certificates or qualifications obtained that are currently valid;
  - (b) a certificate confirming successful completion of any diving course; and
  - (c) a record of the diver's training and experience.
- (5) The personal logbook shall show all entries in chronological order and shall include,
- (a) an entry witnessed and signed by the diving supervisor for each dive; and
  - (b) any entries for medical recompression or hyperbaric exposures which entries shall be witnessed by the presiding physician or diving supervisor.

(6) The personal logbook shall contain for each dive the following,

- (a) the type of diving apparatus used;
- (b) the gas medium breathed;
- (c) the time the diver left the surface;
- (d) the time the diver reached the bottom;
- (e) the maximum depth attained;
- (f) the time the diver left the bottom;
- (g) the time the diver reached the surface;
- (h) the time of the surface interval, if a repetitive dive was undertaken;
- (i) the decompression table used;
- (j) the date;
- (k) the name of the employer and W.C.B. number;
- (l) any unusual incidents;
- (m) the dive location;
- (n) the environmental conditions; and
- (o) the signature of the diving supervisor.

(7) In addition to the information required in subsection (6), for dives originating from a submersible compression chamber, lock-out submersible, or other submerged base, the diver's personal logbook shall also record the depth at the base, the greatest and shallowest depths attained and the time duration of the excursions from the base.

(8) When a diver undergoes a medical examination, the name and address of the examining physician shall be recorded in the diver's personal logbook along with a copy of the physician's written statement obtained in accordance with subsection 26(4).

## **DAILY RECORD**

57. (1) A daily record of each dive shall be kept by the diving supervisor and filed with the employer.
- (2) The daily record shall contain,
- (a) the type of diving apparatus used;
  - (b) the gas medium breathed;
  - (c) the time the diver left the surface;
  - (d) the time the diver reached the bottom;
  - (e) the maximum depth attained;
  - (f) the time the diver left the bottom;
  - (g) the time the diver reached the surface;
  - (h) the time of the surface interval, if a repetitive dive was undertaken;
  - (i) the decompression table used;
  - (j) the date;
  - (k) the name of the diver;
  - (l) the name of the tender(s);
  - (m) the name of the standby diver;
  - (n) any unusual incidents;
  - (o) the dive location;
  - (p) the environmental condition; and
  - (q) the signature of the diving supervisor.
- (3) The employer shall retain the daily record, and any accident or incident reports made under section 5, for a period of five years.

- (4) The diving supervisor shall ensure that,
  - (a) during deep diving operations or where exceptional hazards exist, a tape recording is made of all communications between divers, submersibles and the diving crew during the pre-dive systems checks and during the diving operation; and
  - (b) the tape recording is retained by the diving supervisor for a period of forty-eight hours after the completion of the diving operation.

## **PART X - CONTAMINATED ENVIRONMENTS**

### **APPLICATION**

58. This part applies to diving in contaminated environments.

### **IDENTIFICATION AND PRECAUTIONS**

59. (1) Identification of contaminants that exist, or may occur at the dive site shall be made by a competent person.
- (2) Notwithstanding subsection (1) the owner and employer shall before the commencement of any dive provide an operational plan, available at the dive site specifying,
- (a) identification of the contaminants;
  - (b) the specific health effects to humans;
  - (c) any special clothing or equipment to be used;
  - (d) the identification of the exclusion zone, contaminated reduction zone and support zone;
  - (e) the suitable protective clothing/equipment to be used in the exclusion, contaminant, reduction and support zones;

- (f) the measures to be followed by personnel concerning the movement from one zone to another; and
- (g) a contingency plan detailing,
  - (i) special first aid measures associated with exposure to specific contaminants, and
  - (ii) emergency telephone numbers to reach and secure qualified assistance, within adequate response times.

### **EQUIPMENT – GENERAL**

60. The employer and diving supervisor shall ensure that,

- (a) diving equipment used for contaminated environments conform to the requirements for PART II – EQUIPMENT;
- (b) breathing gases supplied to the diver are from a contaminant-free system;
- (c) emergency breathing equipment for surface support personnel is provided if there is a risk of inhaling dangerous contaminants during the diving operation;
- (d) suitable apparel and equipment is worn to prevent any contaminant exposure to surface support personnel;
- (e) a proper means of safely decontaminating personnel is available at the dive site;
- (f) the dive site is provided with the suitable means and facilities for depositing contaminated clothing and equipment;
- (g) all diving plant and equipment exposed to the contaminant are regularly inspected for any deterioration after each dive or earlier if circumstances dictate;

- (h) the diaphragms of the first and second stage regulators and associated exhaust valves are inspected for any deterioration after each dive or earlier if circumstances dictate;
- (i) contaminated diving plant and equipment are not to be removed from the dive site unless authorized by a competent person;
- (j) diving plant and equipment used in a contaminated environment are not to be used in any subsequent diving operation unless it is free of all contaminants; and
- (k) diving plant and equipment not for reuse are suitably disposed of and such action recorded.

## **RESTRICTIONS**

61. The employer and the diving supervisor shall ensure that S.C.U.B.A. is not used for diving operations involving contaminated environments.

## **SURFACE-SUPPLIED DIVING**

62. The employer and diving supervisor shall ensure that,
- (a) diving operations conducted in contaminated environments meet the requirements of PART VI – SURFACE-SUPPLIED DIVING;
  - (b) in addition to the requirements of clause (a), a diver using surface supply apparatus in contaminated environments shall, for each dive use,
    - (i) a surface supply diving helmet designed and suitable for such work,
    - (ii) a totally enclosed non-permeable synthetic rubber or composite diving suit,
    - (iii) a dive suit that mates to the helmet with a positive seal and locking device,

- (iv) a two-way voice communication system, and
- (v) prophylactic devices, where practicable to minimize contaminant exposure to diving equipment.

### **MINIMUM CREW**

63. In addition to the requirements of clauses 38(b) and (c), the employer and diving supervisor shall ensure that a minimum of four workers are present for each diving operation, of whom one shall be a diver, one a standby diver, one a diver's tender and one a diving supervisor.

### **WORK ZONES**

64. (1) The employer and diving supervisor shall ensure that,
- (a) a dedicated contaminant reduction zone is provided on site with suitable means to decontaminate personnel;
  - (b) a dedicated support zone is provided on site with a suitable means of decontaminating or disposing of apparel and equipment; and
  - (c) a dedicated exclusion zone is provided on site for the handling of the contaminant, and only accessible to authorised and protected personnel.
- (2) The diving supervisor shall ensure that,
- (a) workers entering the exclusion zone wear personal protective equipment suitable for the circumstances;
  - (b) workers only enter and leave the exclusion zone through the contaminant reduction zone; and
  - (c) no food, drink or tobacco is taken into, left or consumed in either the exclusion zone or the contaminant reduction zone.

## **MEDICAL REQUIREMENTS AND EMERGENCY PROCEDURES**

65. The employer and diving supervisor shall ensure that,
- (a) when diving in contaminated environments, the requirements of PART IV – MEDICAL PROCEDURES apply;
  - (b) a contingency plan for emergencies specific to the health and safety of divers and diving support personnel operating in the contaminated environment, is available at the dive site for inspection;
  - (c) prior to workers being exposed to biological contamination, they obtain inoculations relative to the work to be performed and the contaminant to be encountered; and
  - (d) proof of such inoculation is made available to the employer by the worker.

## **CODE FOR THE MEDICAL EXAMINATION OF DIVERS**



## **PROPOSED AMENDMENTS TO THE CODE FOR THE MEDICAL EXAMINATION OF DIVERS**

### **MEDICAL EXAMINATION**

#### **1. Purpose**

The objective of the medical examination is to protect the health of divers by:

- (1) identifying pre-existing health conditions that could be aggravated by exposure to changes in atmospheric pressure (compression and decompression);
- (2) evaluating the effect of changes in atmospheric pressure on divers;
- (3) enabling remedial action to be taken when necessary to ensure the safety of the diver; and
- (4) providing health education on the effects of changes in atmospheric pressure and on the results of the medical examination.

#### **2. Medical Examination**

The medical examination shall include the following:

- (1) Medical and Occupational History;
- (2) Physical Examination;
- (3) Clinical tests;
- (4) Determination of fitness; and
- (5) Health education.

### 3. Screening and Occupational History

At the medical examination the examining physician shall review the diver's personal log. A screening questionnaire\* shall be administered at the examination to identify any history of seizures, syncope, insulin dependent diabetes mellitus, coronary artery disease, sickle cell trait, middle ear surgery, Meniere's disease, lung cysts and blebs, asthma, alcoholism, chronic obstructive or restrictive lung disease, hiatal hernia, recent bone fracture, drug abuse, psychosis, spontaneous pneumothorax, regular medications, aseptic bone necrosis, residual neurological deficit or duodenal ulcer.

An occupational history shall be undertaken to identify:

- (a) previous exposure to changes in atmospheric pressures (both occupational and non-occupational);
- (b) history of frequency and duration of exposure to changes in atmospheric pressure since previous examination;
- (c) history of signs and symptoms that may indicate prior injury as a result of compression or decompression injury such as middle ear trauma, air embolism, decompression sickness, oxygen convulsions, vestibular damage, high pressure neurological syndrome (HPNS) and aseptic bone necrosis.

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\* CSA Standard 275.2, Appendix B, Medical History Questionnaire: Diving Medicine may be used as the screening questionnaire.

#### 4. Physical Examination

During the physical examination, particular attention shall be directed to those systems which may be affected by changes in atmospheric pressure and stress involved in diving, for example cardiopulmonary, ENT, MSS and CNS.

#### 5. Clinical Tests

Clinical tests aid in the assessment of a diver's fitness for and continued exposure to changes in atmospheric pressure and the stress involved in diving.

##### (1) Pulmonary Function Tests

Pulmonary function tests shall be undertaken at the initial examination and annually when indicated. They shall include FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC ratio, FEF 25–75% or other equivalent flow rate. All measurements are to be corrected to body temperature and pressure (BTPS). The instruments shall be calibrated to currently applied standards as published in the “Snowbird Workshop on Standardization of Spirometry”, American Review of Respiratory Illness, Vol. 119, 831 – 838, 1979.

##### (2) X-rays

- (a) A chest X-ray (full inspiration and full expiration views) shall be taken to exclude cysts in the lungs.
- (b) Long bones shall be X-rayed initially, and then every five years. Where aseptic necrosis exists and the diver continues to dive, X-rays shall be done annually. When aseptic necrosis is suspected, X-rays shall be done periodically at the discretion of the examining physician (antero-posterior

(AP) views of hips and shoulders, lateral views of knees).

(3) ECG with exercise tolerance tests

Treadmill exercise tests and ECG should be undertaken since contingencies of underwater work may at any time impose an unexpected need for very high levels of energy expenditures. This test may be carried out periodically thereafter at the discretion of the examining physician.

(4) Audiogram

An audiogram shall be taken initially to ensure hearing acuity, then carried out periodically thereafter at the discretion of the examining physician.

(5) At the discretion of the examining physician, other tests including psychometric testing and psychiatric examination may be undertaken.

## 6. Determination of Fitness

### Absolute contra-indications

The diver should be declared medically unfit where any of the following contra-indications are revealed:

- (a) Any chronic illness that decreases fitness or the ability to cope with stress;
- (b) Any respiratory or cardiovascular impairment (T.B., asthma, emphysema, lung bullae, pneumothorax, myocardial damage, uncontrolled hypertension, vascular insufficiency);
- (c) Chronic sinusitis or otitis media, history of stapedectomy;

- (d) Inner ear barotrauma (perilymphatic fistula);
- (e) Psychiatric disorders;
- (f) Alcoholism; or
- (g) Drug addiction or abuse of any sort.

#### Relative contra-indications

It should be seriously considered that the diver be declared unfit when any of the following are present:

- (a) Lack of physical fitness;
- (b) Gross obesity;
- (c) Osteonecrosis in the femur or humerus; or
- (d) Musculoskeletal impairments, other than minor.

In some cases, if the situation can be remedied or if the diver is fully apprised of the risks of disease progression and is willing to take those risks, the diver may be declared fit with limitations.

There is no evidence that age is a reason for declaring a diver unfit, provided that his exercise tolerance and medical status are adequate for strenuous physical activity. Obviously, candidates over age 40 must be screened very carefully.

#### Temporary Medical Restriction

Conditions that are aggravated by pressure-related disease or conditions are listed below. If they are present, exposure to pressure should be prevented until the disease or condition has been resolved:

- (a) upper respiratory infection (including otitis media and sinusitis);
- (b) chest infections;

- (c) barotrauma (about 7-10d);
- (d) decompression sickness (at least 48 hr. after treatment);
- (e) wounds or physical injury (until healed or resolved);
- (f) surgery (until healed and physical fitness restored); and
- (g) pregnancy.

**7. Fitness Certificate**

The fitness certificate provided to the diver should state that the medical examinations were conducted according to the Code for the Medical Examination of Divers, dated \_\_\_\_\_.



